What is claimed is:

1. A solid-state image pickup device including, in a substrate, a plurality of photoelectric conversion regions for subjecting incoming light to photoelectric conversion, a reading gate for reading a signal charge from the photoelectric conversion regions, and a transfer register for transferring the signal charge read by the reading gate, wherein

a groove is formed on a surface of the substrate, and

the transfer register and the reading gate are formed at a bottom part of the groove.

2. The solid-state image pickup device according to claim 1, further comprising an electrode for voltage application to the reading gate and the transfer register, wherein

a part of the electrode formed in a direction of the transfer register is formed in the groove.

3. The solid-state image pickup device according to claim 2, wherein

a pixel separation region for partitioning each of the photoelectric conversion regions is formed below the groove in the substrate.

4. The solid-state image pickup device according to claim 1, wherein

a light-shielding film is formed to fill at least a gap between the electrode and a sidewall section of the groove.

5. The solid-state image pickup device according to claim

3, wherein

the part of the electrode formed in the direction of the transfer register is formed, in the groove, at least partially on the pixel separation region, and on the transfer register and the reading gate.

6. The solid-state image pickup device according to claim 3, wherein

the part of the electrode formed in the direction of the transfer register is formed, in the groove, at least partially on the pixel separation region, and partially on the transfer register and the reading gate.

7. The solid-state image pickup device according to claim 1, wherein

a sidewall section of the groove is structured by a slope plane.

8. The solid-state image pickup device according to claim 7, wherein

the slope plane has a substrate of a p-type layer.

9. The solid-state image pickup device according to claim 4, wherein

the light-shielding film is applied with a pulse voltage.

10. The solid-state image pickup device according to claim 4, wherein

the light-shielding film is applied with a direct voltage.

11. The solid-state image pickup device according to

claim 1, wherein

including the substrate from the bottom part of the groove to one sidewall section of the groove, the reading gate is formed to be placed across the substrate locating upper to the sidewall.

12. The solid-state image pickup device according to claim 1, wherein

the groove has a lattice structure.

13. The solid-state image pickup device according to claim 1, wherein

the groove is plurally segmented.

14. The solid-state image pickup device according to claim 13, wherein

the groove is bi-segmented,

a sidewall section of a first segment of the groove is included in the reading gate, and

a sidewall section of a second segment of the groove is at least partially included in the transfer register.

15. A method for manufacturing a solid-state image pickup device that includes: in a substrate, a plurality of a pixel separation regions for partitioning a plurality of pixel regions; a plurality of photoelectric conversion regions for subjecting incoming light to photoelectric conversion; a reading gate for reading a signal charge from the photoelectric conversion regions; and a transfer register for transferring the signal charge read by the reading gate, the method comprising

the steps of, after a groove is formed on the substrate:

forming the pixel separation regions, the transfer register, and the reading gate at a bottom part of the groove; and

forming the electrode in the groove.

16. The method for manufacturing the solid-state image pickup device according to claim 15, further comprising the step of, after the electrode is formed,

forming a light-shielding film to fill a gap between the electrode and a sidewall section of the groove via an inter-layer insulation film.

17. The method for manufacturing the solid-state image pickup device according to claim 15, wherein

the groove has a lattice structure.

18. The method for manufacturing the solid-state image pickup device according to claim 15, wherein

the groove is plurally segmented.

19. The method manufacturing for the solid-state image pickup device according to claim 15, wherein

the groove is formed by directly etching the substrate.

20. The method for manufacturing the solid-state image pickup device according to claim 15, wherein

after the substrate is subjected to local oxidation to form a local oxidation film, the groove is formed by removing the local oxidation film.

21. A solid-state image pickup apparatus, comprising:

a solid-state image pickup device including, in a substrate, a plurality of photoelectric conversion regions for subjecting incoming light to photoelectric conversion, a reading gate for reading a signal charge from the photoelectric conversion regions, a transfer register for transferring the signal charge read by the reading gate; and

an optical system for directing the incoming light to the solid-state image pickup device, wherein

the solid-state image pickup device has a groove formed on a surface of the substrate, and

the transfer register and the reading gate are formed at a bottom part of the groove.